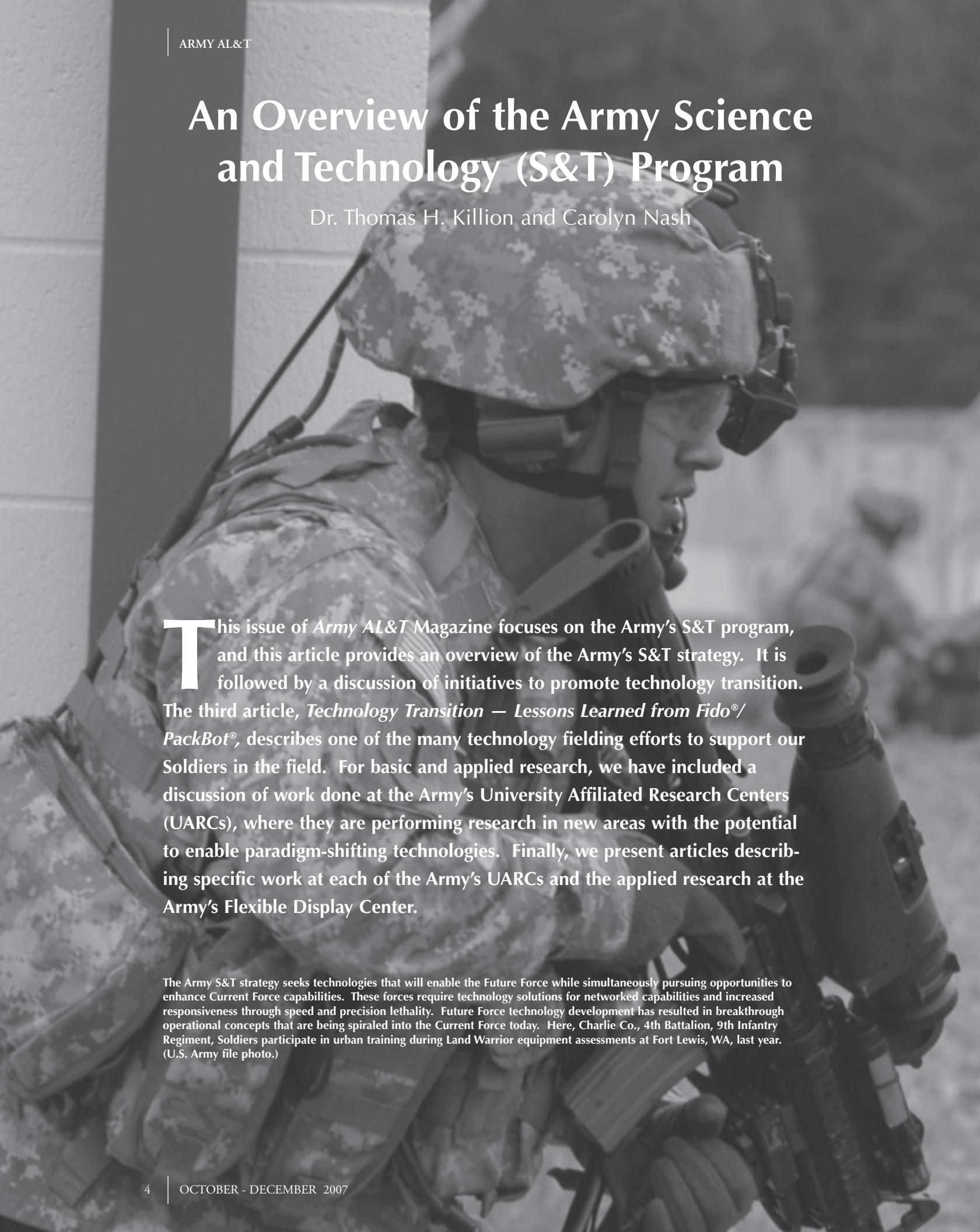
An Overview of the Army Science and Technology (S&T) Program

Dr. Thomas H. Killion and Carolyn Nash



This issue of *Army AL&T* Magazine focuses on the Army's S&T program, and this article provides an overview of the Army's S&T strategy. It is followed by a discussion of initiatives to promote technology transition. The third article, *Technology Transition — Lessons Learned from Fido®/ PackBot®,* describes one of the many technology fielding efforts to support our Soldiers in the field. For basic and applied research, we have included a discussion of work done at the Army's University Affiliated Research Centers (UARCs), where they are performing research in new areas with the potential to enable paradigm-shifting technologies. Finally, we present articles describing specific work at each of the Army's UARCs and the applied research at the Army's Flexible Display Center.

The Army S&T strategy seeks technologies that will enable the Future Force while simultaneously pursuing opportunities to enhance Current Force capabilities. These forces require technology solutions for networked capabilities and increased responsiveness through speed and precision lethality. Future Force technology development has resulted in breakthrough operational concepts that are being spiraled into the Current Force today. Here, Charlie Co., 4th Battalion, 9th Infantry Regiment, Soldiers participate in urban training during Land Warrior equipment assessments at Fort Lewis, WA, last year. (U.S. Army file photo.)

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The Army S&T strategy seeks to develop and mature technology that will enable transformational capabilities in the Future Force while pursuing opportunities to accelerate technology maturity for transition into Current Force systems. This strategy is achieved through sustained investments in a balanced S&T portfolio that simultaneously funds innovative basic research, applied research and advanced technology development.

Our science and engineering (S&E) professionals and essential support personnel are our most important resources to achieve progress in S&T and deliver results for our Soldiers. To execute state-of-the-art S&T programs, we must invest in and maintain state-of-the-art laboratory facilities. Stakeholders, partners, customers and senior decision makers validate S&T program relevance by providing feedback to improve results and business processes.

Key elements of Army S&T strategy include:

- Ensuring investments are aligned with Army missions and capability needs.
- Maintaining balanced and responsive portfolios across:
  - Elements of investment (Budget Activities: 6.1/6.2/6.3).
  - Disciplines and technology areas.
  - Performers (intramural/extramural).
  - Capability pull and technology push.
- Recruiting and retaining highly competent people; protecting facilities to preserve future capabilities.
- Communicating S&T vision and approach to senior decision makers, key stakeholders, partners and customers.
- Establishing and refining processes and metrics to incentivize innovation, efficiency and effectiveness, and facilitate transition.

Aligning the S&T Portfolio to User Needs

S&T investments are aligned with Army missions and capability needs. The U.S. Army Training and Doctrine Command (TRADOC) represents Soldiers in the S&T process. TRADOC combat developers inform the S&T community of needs in terms of capability gaps and technology shortfalls identified through three Army Capabilities Integration Center processes: current gap analysis, capability needs assessments and technology shortfall analysis. TRADOC endorses and validates that the S&T program is pursuing technologies that are relevant to satisfying capabilities needed in the Current and Future Forces as depicted in Figure 1.

HQDA provides guidance to the S&T materiel development community and the TRADOC combat development community on priorities and needs for annual adjustments to the Army S&T portfolio, including proposals for new Army Technology Objective (ATO) programs. The ATOs are the highest priority S&T efforts designated by HQDA. This guidance is signed jointly by the Deputy Assistant Secretary of the Army for Research and Technology (DASA (R&T)); the Assistant Deputy Chiefs of Staff, G-3/5/7; and the Deputy Chief of Staff, G-8, Director for Force Development; and supports objectives in the *Army Modernization Plan* as well as the Defense Research and Engineering Director's strategy.

A Balanced Portfolio

We seek to maintain a balanced and responsive portfolio across a variety of perspectives that incorporate both the development and demonstration of near-term technologies. For example, maintaining investment balance requires simultaneous and sustained funding across all three primary S&T budget components:

- Advanced technology development (6.3) efforts demonstrate technical feasibility at system and subsystem levels and provide a deliberate path for technology spirals to acquisition programs in the near term. This program also enables rapid insertion of new technology into fielded systems as well as limited numbers of technology prototypes. Our technology demonstrations prove the concept, inform the combat developments process and provide the acquisition community

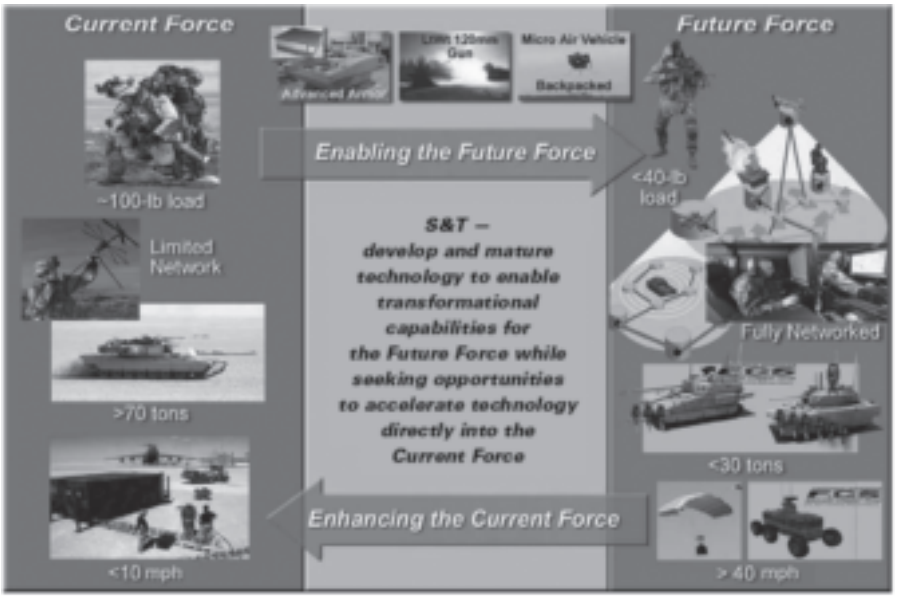


Figure 1. Enhance the Current Force/Enable the Future Force

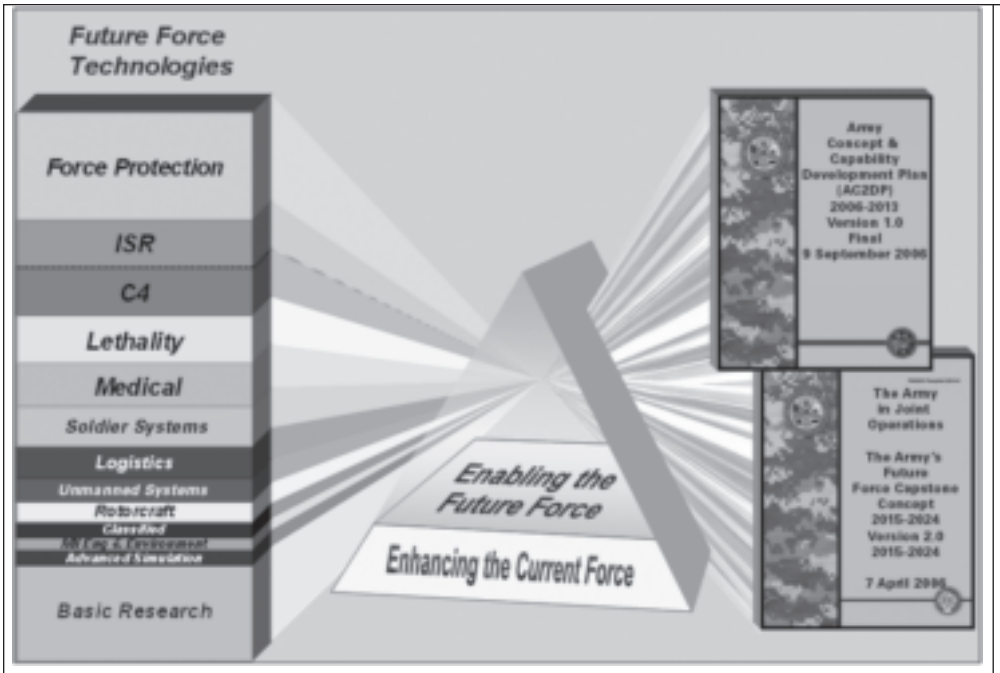


Figure 2. Proportion of Financial Investment Devoted to Future Force Technology Areas

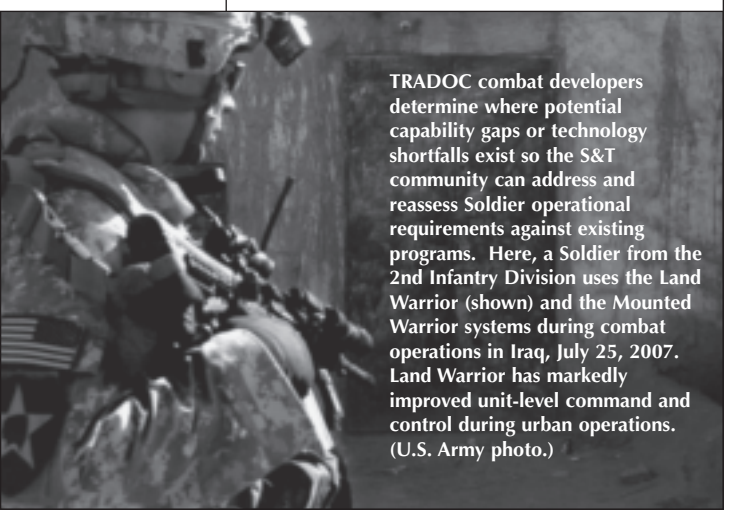
with evidence of technology's readiness to satisfy system requirements.

- Applied research (6.2) for technology applications at component and subsystem levels as well as advanced models for new technology concepts for the midterm.
- Basic research (6.1) provides new knowledge and understanding to solve Army-unique problems as well as novel approaches to solve problems with broad and, at times, unforeseen applications by investing in the basic sciences (e.g., biology, chemistry, physics) for the long term.

An additional component, the Manufacturing Technology program, is a major supporting investment to the advanced technology development programs. Manufacturing technology development seeks to provide solutions in two broad areas: to enable economic producibility for new technology; and to apply new manufacturing techniques that will improve durability and/or cost of operating currently fielded systems.

From another perspective, we describe the diversity and balance in the S&T program in terms of 13 Future Force Technology Areas that are defined herein and graphically depicted in Figure 2 in proportion to their funding totals within the $1.7 billion requested in the President's budget for FY08. The Future Force technology area color bands shown on the left side of the figure are approximately proportional to the financial investment within the Army's requested FY08 S&T budget and *Future Years Defense Plan*. The specific technologies funded in these investment areas are aligned to achieve the Future Operational Concepts (FOCs) defined by TRADOC. The documents depicted on the right describe the FOCs and Joint operations concepts.

- *Force Protection* technologies enable Soldiers and platforms to avoid detection, acquisition, hit, penetration and kill.
- *Intelligence, Surveillance and Reconnaissance (ISR)* technologies enable persistent and integrated situational awareness and understanding to provide actionable intelligence that is specific to Soldier needs across the full range of military operations.
- *Command, Control, Communications and Computers (C4)* technologies provide capabilities for superior decision making, including intelligent network decision agents and antennas to link Soldiers and leaders into a seamless battlefield network.
- *Lethality* technologies enhance Soldiers' ability and platforms to provide overmatch against threat capabilities and include nonlethal technologies enabling tailorable lethality options.
- *Medical* technologies protect and treat Soldiers to sustain combat strength, reduce casualties and save lives.
- *Unmanned Systems* technologies enhance the effectiveness of unmanned air and ground systems through improved perception, cooperative behaviors and increased autonomy.
- *Soldier Systems* technologies provide materiel solutions that protect, network, sustain and equip Soldiers, and non-materiel solutions that enhance human performance.
- *Logistics* technologies enhance strategic response and reduce logistics demand.
- *Military Engineering and Environment* technologies enhance deployability and sustainability.



TRADOC combat developers determine where potential capability gaps or technology shortfalls exist so the S&T community can address and reassess Soldier operational requirements against existing programs. Here, a Soldier from the 2nd Infantry Division uses the Land Warrior (shown) and the Mounted Warrior systems during combat operations in Iraq, July 25, 2007. Land Warrior has markedly improved unit-level command and control during urban operations. (U.S. Army photo.)

- *Advanced Simulation* technologies provide increasingly realistic training and mission rehearsal environments to support battlefield operations, system acquisition and requirements development.
- *Rotorcraft* technologies enhance the performance and effectiveness of current and future rotorcraft while seeking to reduce operational and sustainment costs.
- *Basic Research* investments seek to develop new understanding to enable evolutionary advances or paradigm shifts in future operational capabilities.

Critical Infrastructure — People and Facilities

The pursuit of Future Force technologies will be achieved through the Army's strong in-house research and technology development capability and its partnerships with industry and academia. The Army has world-class research, development and experimental facilities across the United States. These facilities have modern research tools and are staffed with highly dedicated engineers, scientists and support people who perform research and technology development as well as facility sustainment. This infrastructure has been shaped to meet the Army's full spectrum of technology needs. The Army has four major commands and an element of Human Resources Command (HRC) responsible for technical leadership, scientific advancement and support for the acquisition process. The four commands are the Research, Development and Engineering Command; U.S. Army Corps of Engineers; Medical Research and Material Command; and the Space and Missile Defense Command. The Army Research Institute for the Behavioral and Social Sciences is part of HRC under operational control of the Deputy Chief of Staff for Personnel.

Incentivize Innovation, Efficiency and Effectiveness — Facilitate Transition

The Army S&T program is executed within Army facilities by contracts to industry and grants to universities, or through cooperative efforts with other DOD organizations, national laboratories, industry, universities and international partners. The Army laboratories' and research, development and engineering centers' (RDECs') leaders work continually to improve the S&T enterprise effectiveness, apply Lean Six Sigma principles to establish and refine processes, identify metrics to incentivize innovation and efficiency, while also promoting technology transition. These initiatives are described in a separate article in this issue.

Communicating the S&T Vision

We rely on a broad range of strategic communications initiatives to convey the S&T vision and priorities to senior decision makers, key stakeholders (such as Congress), partners and customers. The Army S&T program is also coordinated with the programs of other services and defense agencies through the DOD Reliance 21 processes, including Office of the Secretary of Defense strategic reviews and program briefings.

The Army's S&E professionals are innovation change agents committed to developing the technologies that will provide America's Soldiers with capabilities superior to any adversary, allowing our troops to achieve decisive results and return home safely. Our balanced S&T investment portfolio — developed in collaboration with our stakeholders, customers and private sector partners — is executed through a vital infrastructure that serves as a relevant and responsive component of the DOD-wide research and technology enterprise.

SGT Philip Morici models the improved Land Warrior individual Soldier combat system during an equipment demonstration at the Rayburn House Office Building in Washington, DC, June 6, 2007. (U.S. Army photo by Gerry J. Gilmore.)

DR. THOMAS H. KILLION is the DASA(R&T) and Army Chief Scientist. He earned B.A. degrees in psychology and English from St. Mary's College and a Ph.D. in experimental psychology from the University of Oregon. Killion oversees the Army's R&T program, which encompasses all Army laboratories and RDECs.

CAROLYN NASH is the Deputy Director for Science and Technology Integration, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology. She holds a B.A. in physics from the University of California-Berkeley and an M.S. in physics from Wright State University.